

2016 Monitoring Summary



Shoal Creek at FS Road 500 in Talladega National Forest (Cleburne County) (33.72529/-85.60115)

BACKGROUND

Shoal Creek is among the least-disturbed watersheds within the Talladega Upland ecoregion, based on landuse, road density, and population density. Since 2000, it has been monitored by the Alabama Department of Environmental Management (ADEM) as a “high quality” reference watershed for comparison with other streams within the ecoregion. Data from reference watersheds are used to characterize natural or background conditions expected in different ecoregions throughout the state. Shoal Creek was sampled in 2016 to provide high-quality reference reach data for Piedmont streams.

In addition, Shoal Creek has been identified as one of 50 Strategic Habitat Units (SHU) by the U.S. Fish and Wildlife Service (USFWS) and the Alabama Rivers & Streams Network (ARSN). SHUs are recognized as high-quality habitats occupied by federally listed and state imperiled species.



Figure 1. Shoal Creek at SHLC-3 on April 6, 2016.

WATERSHED CHARACTERISTICS

Watershed characteristics are summarized in Table 1. A tributary of Choccolocco Creek, Shoal Creek is classified as an *Outstanding Alabama Water/Swimming/Fish and Wildlife (OAW/S/F&W)* stream located within the Talladega National Forest. Its *OAW* classification recognizes Shoal Creek’s ecological and recreational significance to Alabama. As a SHU, the watershed maintains a geomorphically stable channel and a natural flow regime that support the behavior, growth, and survival of four federally listed endangered and threatened species, and seven species listed to be of the *Highest* or *High Conservation Concern* by the State of Alabama.

The Shoal Creek watershed at SHLC-3 is 96% forested with no permitted outfalls. It is very sparsely populated. There are several recreational hiking trails and campgrounds in and near the watershed. There are few roads in the watershed. Both EPA’s Healthy Watershed Initiative (HWI) and ADEM’s measure of watershed disturbance rank the Shoal Creek watershed as among the best throughout Alabama.

REACH CHARACTERISTICS

General observations (Figure 1, Table 2) and a habitat survey (Table 3) were completed during the macroinvertebrate assessment. In comparison with reference reaches in the same ecoregion, they give an indication of the physical condition of the site and the quality and availability of habitat. Like other streams in ecoregion 45D, Shoal Creek at SHLC-3 is a medium-high gradient stream characterized predominantly by boulder, cobble, and bedrock substrates. Overall habitat quality and availability was rated as *Optimal* for supporting the macroinvertebrate communities .

Table 1. Summary of general watershed characteristics: SHLC-3 (2016)

Watershed Characteristics	
Basin	Coosa
Drainage Area (mi²)	17.9
Ecoregion^o	45D
Assessment Unit	AL03150106-0501-105
Use Class	OAW/S/F&W
AU Category	1
12-digit Hydrologic Unit Code (HUC)	031501060501
Conservation Status	
Strategic Habitat Unit †	35 Shoal Ck (0315)
Landuse Categories (2011 National Land Cover Dataset)	
Open Water (%)	0.6
Wetland, Total (%)	0.3
Wetlands, Woody (%)	0.3
Forested, Total (%)	95.8
Forested, Deciduous (%)	48.7
Forested, Evergreen (%)	46.6
Forested, Mixed (%)	0.5
Shrub/Scrub (%)	0.4
Grassland/Herbaceous (%)	0.4
Pasture/Hay (%)	0.1
Developed, Total (%)	2.4
Developed, Open Space (%)	2.4
Population/km² (2010 US Census)	0
Roads	
Road Density	1.1
# Road Crossings per Stream km	0.2
Watershed Disturbance Score*	31
Watershed Disturbance Category*	1

^o Talladega Upland

† 12-digit HUC located in a Strategic Habitat Unit.

* Measure of watershed disturbance based on landuse, population, and road density summarized in this table.

Table 2. Physical characteristics of Shoal Creek at SHLC-3, April 28, 2016.

Physical Characteristics	
Width (ft)	35
Canopy Cover	Mostly Shaded
Depth (ft)	
Riffle	0.5
Run	1.5
Pool	5.0
% of Reach	
Riffle	25
Run	25
Pool	50
% Substrate	
Boulder	20
Cobble	20
Gravel	20
Sand	24
Silt	5
Organic Matter	11

Table 3. Results of the habitat assessment survey conducted on Shoal Creek at SHLC-3, April 28, 2016.

Habitat Survey	% Max Score	Rating
Instream Habitat Quality	86	Optimal (80-100)
Sediment Deposition	51	Marginal/Sub-optimal (51-54)
Riffle Frequency	80	Optimal (80-100)
Bank Vegetative Stability	88	Optimal (80-100)
Riparian Zone Measurements	90	Optimal (85-100)
Habitat Assessment Score	159	
% Maximum Score	80	

BIOLOGICAL SURVEYS

The benthic macroinvertebrate community was sampled using ADEM's Intensive Multi-habitat Bioassessment methodology (WMB-I). Measures of taxonomic richness, community composition and pollution tolerance were used to assess the overall health of the macroinvertebrate community in comparison to conditions expected in north Alabama streams and rivers. Each site is placed in one of six levels ranging from 1, or *natural*, to 6, or *highly altered*. The condition of the macroinvertebrate community was rated as *Excellent*, identifying Shoal Creek at SHLC-3 as a level 2, or near natural, site. Taxa richness and diversity are exceptional, with 98 total taxa and 46 pollution-sensitive taxa collected at the site. Thirteen of the taxa are only found in the most pristine streams throughout Alabama and the southeast. (Table 4)

Table 4. Results of the Macroinvertebrate assessment conducted on Shoal Creek at SHLC-3, April 28, 2016.

Macroinvertebrate Assessment		Results
Taxonomic richness and diversity metrics		
Total # taxa		98
# rare and highly sensitive taxa		13
# sensitive taxa		46
# sensitive EPT taxa		24
Percent taxon metrics		
% sensitive EPT taxa		24
% sensitive taxa		47
% rare and highly sensitive taxa		13
% tolerant individuals		11
% tolerant taxa		7
Percent individual metrics		
% rare and highly sensitive individuals		11
% sensitive individuals		28
% sensitive EPT individuals		13
WMB-I Survey Score		2
WMB-I Survey Rating		Excellent (1-2)

WATER CHEMISTRY

Results of water chemistry analyses are summarized in Table 5. In situ measurements and water samples were collected monthly and semi-monthly (metals), from March through October 2016 to help characterize the reach. In situ parameters were well within ranges to protect its OAW use classification. Water temperatures ranged from 13.6 to 25.0 degrees Celsius, or 56.5 to 77.0 degrees Fahrenheit. Dissolved oxygen concentrations ranged from 7.6 to 10.1 mg/L, reflecting the cool temperatures and high percent riffle habitat. Turbidity was also low, ranging from 1.4 to 5.3 NTU. Median sediment, nutrient, and metals concentrations were among the lowest measured throughout the Piedmont ecoregion. However, the *E. coli* sample collected in September indicated 410.6 colonies/100 mL of sample, exceeding the single sample criterion for OAW streams.

Table 5. Summary of water quality data collected March-October, 2016. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median, average (Avg), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Parameter	N	Min	Max	Med	Avg	SD	E
Physical							
Temperature (°C)	9	13.6	25.0	21.3	20.0	4.5	
Turbidity (NTU)	10	1.4	5.3	2.0	2.3	1.1	
Total Dissolved Solids (mg/L)	8	14.0	48.0	29.5	29.2	9.9	
Total Suspended Solids (mg/L)	8	< 1.0	5.0	0.8	1.6	1.6	
Specific Conductance (µmhos/cm)	9	19.0	44.9	32.5	31.3	8.9	
Hardness (mg/L)	4	6.3	15.7	10.5	10.8	4.2	
Alkalinity (mg/L)	8	5.7	22.3	14.4	13.9	5.7	
Monthly Stream Flow (cfs)	10	0.1	38.8	3.8	10.1	12.2	
Measured Stream Flow (cfs)	8	2.3	38.8	9.7	12.6	12.4	
Chemical							
Dissolved Oxygen (mg/L)	9	7.6	10.1	8.2	8.5	0.9	
pH (SU)	9	6.5	7.3	6.9	6.9	0.3	
J Ammonia Nitrogen (mg/L)	8	< 0.007	0.044	0.004	0.010	0.014	
J Nitrate+Nitrite Nitrogen (mg/L)	8	< 0.002	0.114	0.046	0.050	0.050	
J Total Kjeldahl Nitrogen (mg/L)	8	< 0.050	0.448	0.131	0.178	0.153	
J Dis Reactive Phosphorus (mg/L)	8	0.003	0.009	0.008	0.007	0.002	
J Total Phosphorus (mg/L)	8	0.005	0.020	0.018	0.016	0.005	
CBOD-5 (mg/L)	8	< 2.0	< 2.0	1.0	1.0	0.0	
COD (mg/L)	8	< 2.7	7.0	5.0	4.3	2.4	
J TOC (mg/L)	8	1.0	2.3	2.0	1.8	0.4	
Chlorides (mg/L)	8	1.0	1.3	1.2	1.2	0.1	
Sulfate (mg/L)	8	0.88	1.95	1.18	1.32	0.42	
Total Metals							
J Aluminum (mg/L)	4	< 0.106	0.116	0.053	0.069	0.032	
J Iron (mg/L)	4	0.143	0.492	0.304	0.311	0.178	
J Manganese (mg/L)	4	< 0.004	0.052	0.028	0.028	0.021	
Dissolved Metals							
Aluminum (mg/L)	4	< 0.106	< 0.106	0.053	0.053	0.000	
Antimony (µg/L)	4	< 0.342	< 0.383	0.192	0.186	0.010	
Arsenic (µg/L)	4	< 0.276	< 0.415	0.208	0.190	0.035	
Cadmium (µg/L)	4	< 0.311	< 0.385	0.192	0.183	0.018	
J Chromium (µg/L)	4	0.350	< 0.445	0.222	0.254	0.064	
Copper (µg/L)	4	< 0.218	< 0.454	0.227	0.198	0.059	
J Iron (mg/L)	4	0.104	0.261	0.184	0.183	0.090	
Lead (µg/L)	4	< 0.362	< 0.428	0.181	0.189	0.016	
J Manganese (mg/L)	4	< 0.004	0.020	0.006	0.008	0.008	
J Nickel (µg/L)	4	< 0.705	0.924	0.352	0.495	0.286	
Selenium (µg/L)	4	< 0.395	< 0.505	0.252	0.239	0.028	
Silver (µg/L)	4	< 0.365	< 0.478	0.239	0.225	0.028	
Thallium (µg/L)	4	< 0.348	< 0.514	0.174	0.195	0.042	
J Zinc (µg/L)	4	< 0.522	2.565	1.142	1.278	0.978	
Biological							
Chlorophyll a (mg/m³)	8	0.27	1.07	0.53	0.61	0.33	
J E. coli (MPN/DL)	8	5.2	410.6 ^H	37.6	81.6	135.1	1

E=# of samples that exceeded criteria; H=F&W human health criterion exceeded; J=estimate; N=# samples

SUMMARY

Located within the Talladega National Forest, Shoal Creek at SHLC-3 is of exceptional quality, containing no permitted outfalls and almost entirely forested. It is classified as an OAW stream, recognizing its ecological and recreational significance to Alabama. As a SHU, the watershed maintains a geomorphically stable channel and a natural flow regime that support the behavior, growth, and survival of four federally listed endangered and threatened species, and seven species listed to be of the *Highest* or *High Conservation Concern* by the State of Alabama.

Based on the 2016 monitoring conducted by the ADEM, water quality conditions continue to be very high, exhibiting low water temperatures, and low concentrations of sediment, nutrients, and metals. Macroinvertebrate diversity and taxa richness within the reach are among the highest sampled in the state.

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